DHI CASE STORY

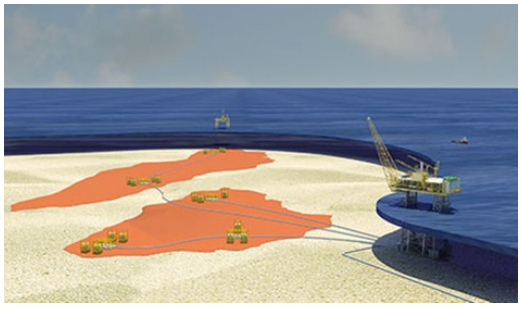
WE SUPPORT THE WHEATSTONE LNG PROJECT

Impact studies for one of Australia's largest resource projects

Accurate predictions of potential impacts on the marine ecosystem are essential at the Environmental Impact assessment (EIA), planning and the implementation stages of marine projects to quantify and manage risks and impacts. We have developed an assessment tool and a scenario approach to predict dredge-related environmental impacts for the Wheatstone Project for Chevron. With both the upstream and downstream dredging contractors having adopted the tools, it is slated to become part of the proactive management systems put in place to ensure that environmental risks are managed and environmental objectives are met.

THE WHEATSTONE PROJECT

The Wheatstone LNG Project, located in Western Australia's Pilbara region, is one of Australia's largest resource projects. The Pilbara coastline and marine waters are recognised as a diverse and ecologically rich aquatic system. Chevron Australia – as the majority shareholder and operator of the Wheatstone project– has undertaken comprehensive environmental studies and project optimisation in accordance with their Environmental Stewardship to achieve environmental approvals from both the Western Australian and the Commonwealth Governments.



Artist's impression of Wheatstone Upstream components (©Chevron)

Artist's impression of Wheatstone Project at Ashburton North (©Chevron)

SUMMARY

CLIENT

Chevron Australia Pty Ltd.

CHALLENGE

Requirement for quantification of potential and likely impacts based on limited project and site-specific data at Environmental Impact Assessment (EIA) stage

SOLUTION

- Development of receptor tolerance limits for key receptors
- Application of a scenario modelling approach to develop envelopes of possible impacts from a comprehensive set of combinations of dredge
- Development of Impact Zones based on the above

VALUE

- Potential dredge impacts captured
- Easy identification of critical dredge and climatic scenarios
- Programme optimisation to achieve environmental objectives
- Effective and time-saving assessment of the environmental effects of changes to dredge plan

LOCATION / COUNTRY

Northwest Shelf, WA, Australia

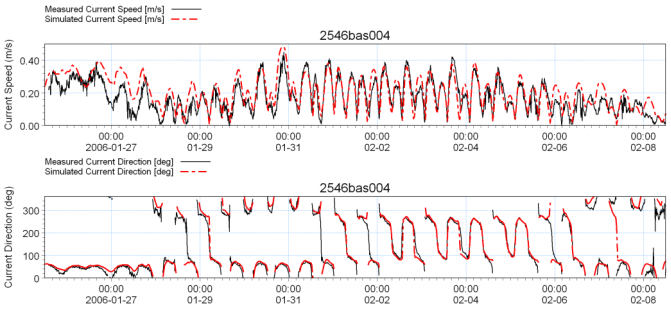
DREDGING – THE MOST IMPORTANT ENVIRONMENTAL RISK FACTOR

Dredging was identified by Chevron as a key environmental risk factor at an early stage in the project. As such, we focussed on the quantification of dredge-derived impacts during and following the EIA. The potential impacts were highly dependent on dredge methodology and schedule. This was mainly owing to a spatially varying distribution of environmental receptors, combined with seasonally varying climatic conditions. This presented a particular challenge at the EIA stage prior to the definition of a detailed dredge plan. The dredge period was estimated at four years at the EIA stage. Simulation time for a full dredge period at high resolution was significant. Modelling the full dredge period would therefore have either of the following risks:

Inaccurate delineation of potential impacts if only a few possible dredging and climatic conditions were simulated

Pushing the modelling towards too low resolution to save time or delaying the project if a larger number of possible dredge scenarios was carried out

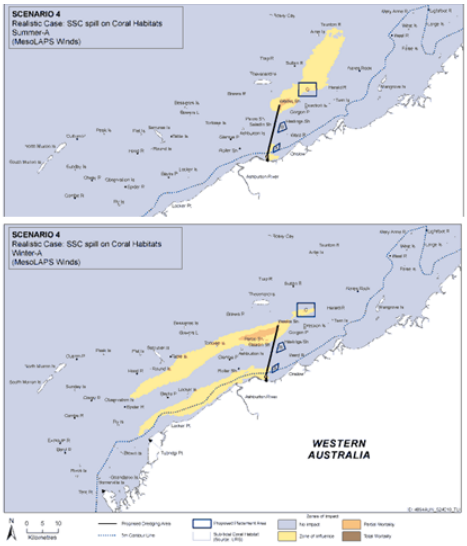
A detailed assessment of the climatic conditions at the site revealed that wind driven net currents are significant and seasonally variable. This will play a critical role in dispersion of any spills or discharges, and it was thus crucial that the model was capable of reproducing the net currents.



Example of hydrodynamic model validation with wind driven net currents being a critical component

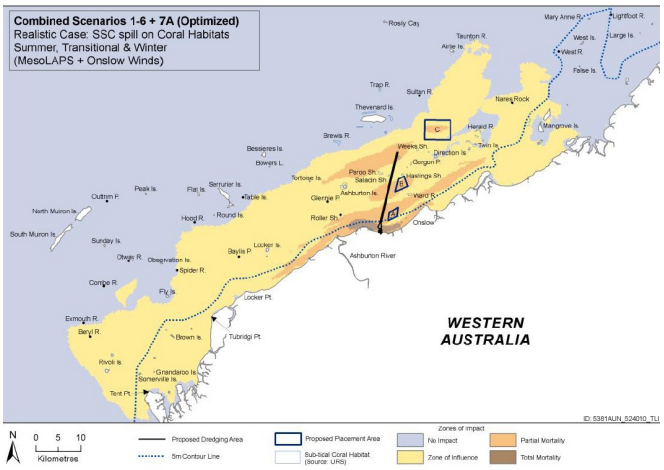
WE ADOPT A COMPREHENSIVE SCENARIO-BASED MODELLING APPROACH

Our solution to the challenge of capturing possible impacts for a full range of dredge scenarios and climatic conditions was to develop a shorter term scenario modelling approach. Representative seasonal periods were selected based on detailed analysis of the climatic data. A number of dredge scenarios were defined in order to cover identified critical dredge components along a series of defined dredge areas. Both 'average' and 'worst case' spill rates were estimated for each dredge activity. Site specific tolerance limits for key environmental receptors were developed; enabling the prediction of impact zones for Benthic Primary Producer Habitats (BPPH).



Examples of predicted zones of impact for same dredge scenario for 2 different climatic scenarios (© Wheatstone EIS)

By running a full matrix of simulations with all combinations of climatic, dredge and spill scenarios, we derived a complete envelope of possible impacts, taking the schedule risks out of the equation. Typically, we ran around 200 scenarios for each dredge plan investigated, to provide a full overview. But as these were relatively short and could be run in parallel on a large number of processors, we were able to carry out the simulation within a few days.The scenario approach provided added benefit as it readily identified critical dredge and climatic components. It was therefore effective for testing alternative dredge programmes and schedule optimisation.



Example of predicted 'envelope' of zones of impact for a full dredge programme © Wheatstone EIS

The modelling approach and the development of new dredge scenarios as the project progressed were carried out in close collaboration with Chevron and design consultants. This close dialogue ensured that all parties were on the same page so that progress could be made expediently.

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